

Digital Photo Series

A proposal for the Joint Fire Science Program – AFP2004-4, Task 1

Describe and apply a specific approach to delivering, to field level practitioners, fire science information or tools related to the topic areas of the Joint Fire Science Program.

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Abstract: Wildland fire professionals require accurate, detailed fuels information to effectively plan and implement a whole range of fuels and fire management actions. The Natural Fuels Photo Series, a photo guide designed for field use, is a source of high quality fuels data for a wide variety of forest and range ecosystems throughout the United States. These data were developed for on-the-ground assessments, however, and are not fully utilized in the planning environment. Technological advances since the inception of the original Photo Series projects, coupled with development of new fire- and natural resource-based software applications highlight the need to bring the Photo Series concept into the electronic age. The Digital Photo Series will be a software application that will include a fuels database with a user-friendly interface that will leverage the already high value of the Photo Series data. The Digital Photo Series will be able to include data that were collected, but not included in the original books because of publication limitations, as well as added functionality for fire and fuels planners and scientists (e.g., browsing, querying, and comparison functions, a fuelbed builder, output formatted to interface with Behave, Fofem, Consume 3.0, Fuel Characteristic Classification System, etc.). The Digital Photo Series will complement, not replace, the paper and ink versions available now and in the future; it will be a tool to more easily and effectively use the comprehensive data sets available for numerous ecosystems for strategic planning and analysis, and for implementation of field projects.

Individual Proposing Study: _____
Clinton S. Wright, Research Forester Date

Authorized Agency Representative: _____
Dr. David V. "Sam" Sandberg, Team Leader Date

Introduction

Justification and Background

Accurate, complete fuels data are critical for all fire management planning and implementation. Fuels data are often lacking or difficult to obtain for many areas or ecosystems. The Joint Fire Science Program (JFSP) was chartered to stimulate research and development in fuels and fire science. With assistance from the JFSP and others, the Fire and Environmental Research Applications (FERA) team has developed the Natural Fuels Photo Series to address this critical need for high quality fuels information.

The Natural Fuels Photo Series is a popular and valuable tool with a large, diverse user base. Photo series are currently available, being developed, or proposed for a wide range of ecosystem types nationwide. While primarily intended as a fuel inventory resource for fire managers and practitioners, the Photo Series has proven to be a rich data source for the fire science, landscape ecology, wildlife biology, and modeling communities as well.

The Photo Series was designed as field-based inventory tool in book form. At the time of its conception (mid-1990's), conventional printing was the most effective way to present the images and data of the Photo Series in a concise, economical, user-friendly package. Changes in technology, and development of new fire- and natural resource-based software applications that require fuel and stand information as inputs have highlighted the need to enhance the data and utility of the Photo Series by making it available in an electronic format. Furthermore, fire and fuels management require more and better fuel and vegetation data now more than ever, like those included in the Photo Series, to effectively plan treatments, including prescribed fire and mechanical fuels treatment.

There are currently ten Natural Fuels Photo Series volumes in circulation (see Citations section), with five volumes in various stages of completion (southeastern U.S., western U.S., northeastern U.S., southern Arizona/New Mexico, central Mexico), and three volumes proposed (ponderosa pine, ecosystem restoration, southern Illinois). Each volume documents fuels conditions in 3-4 ecosystems and contains 30-40 sites on average with detailed summary data and high-resolution photographs (both stereo and standard view). The FERA team, located at the Pacific Wildland Fire Sciences Laboratory, in Seattle, Washington, is the custodian of the raw and processed data, manuscript proofs, and photographic media that have been used to produce the Photo Series books. Close familiarity will allow us to extract the maximum benefit from these data sets and materials when developing the Digital Photo Series, the electronic complement to the Natural Fuels Photo Series books.

Project Objectives

The objective of this project is to create a software application that will include a geo-referenced database and user interface to enhance current and future Natural Fuels Photo Series (Figure 1). The Digital Photo Series will also allow us to include data that were collected but not included in the space-constrained book versions. This application will also add database functionality (the ability to query and browse the database and images), the ability to compare the fuels on sites side by side, and the ability to build and save custom fuelbeds. Through careful and thoughtful system engineering, data from the Digital Photo Series will be easily extracted and formatted to interface with existing and future fire and fuel-management software packages (e.g., Fuel Characteristic Classification System, Behave, Fofem, Consume 3.0, etc.). The end result will be a stand-alone software application that will be continuously updated as new data become available (i.e., as new photo series are developed). The Digital Photo Series will complement, not replace, the paper and ink versions available now and in the future; it will be a tool to more easily and effectively use the comprehensive data sets available for numerous ecosystems for strategic planning and analysis, and for implementation of field projects.

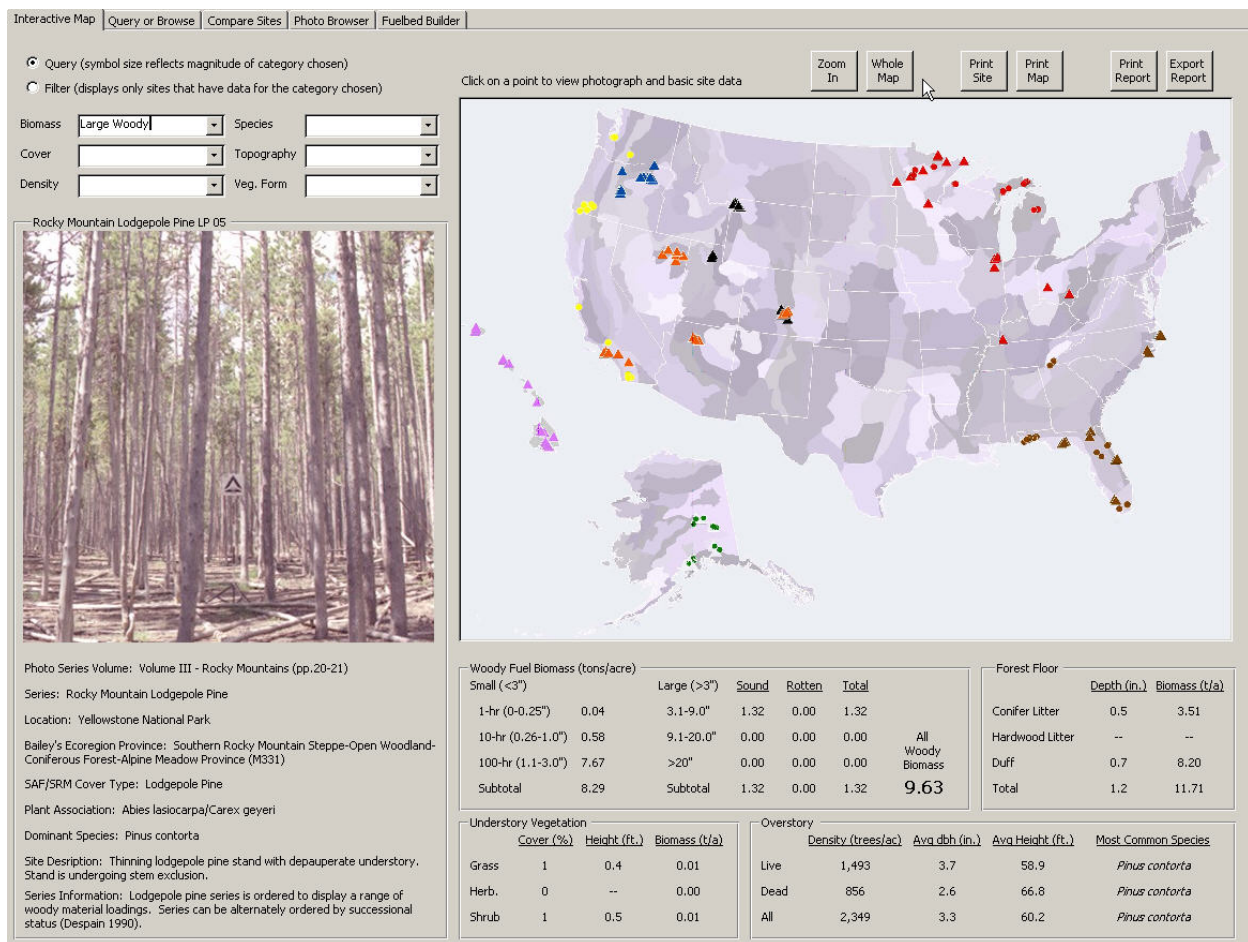


Figure 1. Prototype graphical user interface for the Digital Photo Series. Multiple tabs will incorporate a variety of program functions, including browsing, querying, and comparison features, and a fuelbed builder routine.

Digital Photo Series Description

The Digital Photo Series will leverage the very large, detailed, expansive data set developed during the course of the various phases of the Natural Fuels Photo Series (phases II and III were funded by the JFSP). As with the book version, data characterizing all of the vegetation and fuels (not just the down woody and surface fuels) in an ecosystem will be viewable from the program screens, and available as printed or saved reports. The Digital Photo Series will use the data from the Natural Fuels Photo Series; future versions may incorporate data from other published photo series (e.g., Maxwell and Ward 1985, Ottmar and Hardy 1989, Ottmar et al. 1990, etc.). Photo Series Explorer (AFS/AS 2001), a PC-based tool that presents some data from a limited number of older photo series (low resolution page scans and basic fuels data) does not include the breadth or complexity of function that will be available in the Digital Photo Series, nor does it include any data from the Natural Fuels Photo Series.

The Digital Photo Series will incorporate a zoomable, interactive map, high quality images, and data summarizing all fuel and vegetation conditions in an ecosystem. The user will have great flexibility when browsing or querying the data and photos (e.g., by ecosystem, by volume, by fuelbed category, by Bailey's ecoregion, by vegetation form, by topographic condition, etc.). Features that allow users to compare data from more than one photo series site, and to build fuelbeds using data derived from several photo series sites will also be incorporated into the program design. Data output of selected or customized fuels and vegetation data will be designed to link easily with fire- and natural resource-based

software applications (e.g., Behave, Fofem, Consume 3.0, Fuel Characteristic Classification System, etc.) that require fuels and stand data. A standard reporting feature will allow users to print formatted reports or to save reports to a variety of mainstream digital file formats (spreadsheets, word processors, etc.). The system will be engineered to accept new photo series as they are developed, allowing it to grow and evolve as more data become available. Additional features will be developed with input and ideas from current users of the Natural Fuels Photo Series books and fire and fuels planners, managers and scientists.

Materials and Methods

Development of the Digital Photo Series will occur in four overlapping phases. Phase 1 will include system design and engineering. Phase 2 will include data entry and compilation, as well as photo compilation and digitization. Phase 3 will include software programming and initial testing. Phase 4 will include application beta testing, distribution and technology transfer.

Phase 1 – The FERA team is in the process of developing and completing three significant fire-management software tools (FCCS-Fuel Characteristic Classification System; FEPS-Fire Emissions Prediction System; CONSUME 3.0), and has the proven application design and development capabilities in place. A staff of fuel scientists, ecologists, foresters and programmers conversant in the language of fuels and natural resource science makes FERA the only team that can fully develop the photo series data set into a robust software application. Lessons learned from earlier and ongoing programming endeavors will allow the design and engineering phase to use agile techniques to produce the most useful product.

Users of the book-form Photo Series will be surveyed to determine what additional features they would like to see in the Digital Photo Series. Input from the wider user community will also be solicited to insure that the interface design and output specifications meet the needs of fire and fuels managers and planners. This process will be carried out through the distribution of a questionnaire and informal discussions with interested parties.

Phase 2 – Photo Series data are in various electronic formats in the FERA archive. Many of these data will require re-coding and analysis to extract their full value for the Digital Photo Series. Significant advances in computing technology, even over the last ten years, provide an opportunity to present the data collected from past Photo Series projects in a new and enhanced format for a new set of target users. Data collected from over 300 sites will be consolidated and standardized to be accessed through a graphical user interface in the Digital Photo Series.

The Digital Photo Series will be a database with high quality images and very detailed fuels information that can be accessed in a structured manner through a thoughtfully designed, easy to use interface.

Phase 3 – The software will be developed with an appropriate programming language (e.g., Java, VB.net, XML, C++, etc.) so as to produce a stable application with a user-friendly interface and the capacity to absorb large amounts of data as more Photo Series are completed in the future. The system design and engineering phase (phase 1) will identify the programming environment that will best suit the data and interface needs. Testing and improvement will occur throughout the agile programming process.

Phase 4 – The final phase in the development process for the Digital Photo Series will include beta testing, documentation and technology transfer. Beta testers will be drawn from in-house sources and from the Photo Series user community. Documentation will take the form of a digital help file and user's manual that will be distributed with the application. The application will be a stand-alone software program that will be made available via the world wide web (<http://www.fs.fed.us/pnw/fera>) and through the mail on CD-ROM for users that lack Internet connectivity. Updates will be available online.

Deliverables

The Digital Photo Series, a fully documented, stand-alone software application that incorporates the photos and data from the Natural Fuels Photo Series, is the science application product that this project will generate. A stand-alone application is specified so that user's who lack Internet connectivity will still be able to take advantage of the high quality fuels data and images.

Science Application and Delivery

This application will be distributed via the Internet and on CD-ROM. Prospective users will be notified of its availability through announcements on our website (<http://fs.fed.us/pnw/fera>), in professional periodicals (Fire Management Notes), and established contacts with current and former collaborators and cooperators. Software updates will be made available online as they are developed. A roster of registered user's will be kept to allow for news about program changes and updates to be delivered to users.

The book form of the Photo Series has already been incorporated into the fire management training series (S and Rx classes). A brief tutorial and lesson plan will be designed to teach students in these classes the capabilities of the Digital Photo Series and how to use it. In an effort to reach a broader array of users, an online seminar (web seminar or web conference) will be scheduled and delivered once the application has been in circulation for a short time. These seminars will include a quick lesson on how to navigate the database and user interface, as well as practical examples of how the Digital Photo Series can be used for fire and fuels management.

Citations

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Qualifications of Investigators

Clinton S. Wright is a research forester with the USDA Forest Service, Pacific Northwest Research Station at the Pacific Wildland Fire Sciences Laboratory in Seattle. His areas of expertise include fuel measurement and characterization, fuel consumption, fire effects and fire ecology. He has participated in all aspects of production of the Natural Fuels Photo Series including planning, field data collection, data analysis, manuscript preparation and printing.

Robert E. Vihnanek is a supervisory forester with the USDA Forest Service, Pacific Northwest Research Station at the Pacific Wildland Fire Sciences Laboratory in Seattle. Bob has over 20 years of fire research experience, as well as several years in fire management. He leads field crews that collect data for fuel inventory, fuel consumption and fire effects research. He has supervised the production of all of the Natural Fuels Photo Series volumes to date.

Roger D. Ottmar is a research forester with the USDA Forest Service, Pacific Northwest Research Station at the Pacific Wildland Fire Sciences Laboratory in Seattle. He has over 25 years of fire research experience, and has been a leader in the compilation of fuels data. He has secured funding for and directed all of the Natural Fuels Photo Series projects.